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EDITORIAL NOTE

The Society for Clinical and Experimental Hypnosis is pleased to announce that the Academy of Applied Psychology in Dentistry has selected *The International Journal of Clinical and Experimental Hypnosis* as their official organ.

Beginning with the July issue, a section of the Journal will be devoted to an abstracting and reviewing of material relating to the use of hypnosis in dental medicine. The Academy of Applied Psychology in Dentistry will be responsible for the organization and editing of this section.

The *Journal* and *Society* extend a warm welcome to the Academy of Applied Psychology in Dentistry and look forward to a continuing and growing relationship.

M.V.K.

THE AMERICAN BOARD OF MEDICAL HYPNOSIS

"Physicians engaged in the general practice of medicine are eligible for certification as Diplomates of the American Board of Medical Hypnosis on completion of requirements mentioned in the Statement of Policy. As a substitute for the prerequisite of prior Diplomate status in one of the American Medical Specialty Boards approved by the A. M. A. Council on Medical Education and Hospitals and the Advisory Board for Medical Specialties, the general physician must supply documentation for seven years of experience with medical hypnosis, and in addition he must be an *Active* Member of the American Academy of General Practice."

JEROME M. SCHNECK M.D.
BERNARD B. RAGINSKY M.D.

AMERICAN BOARD OF MEDICAL HYPNOSIS

December 31, 1959 is the deadline for receiving applications from physicians who wish to request certification by the American Board of Medical Hypnosis without the requirement of formal examination and without the possession of prior certification as a specialist by one of the American Medical Specialty Boards listed under the auspices of the American Medical Association. Such certification in hypnosis prior to the deadline will be based on education and experience in accordance with criteria established by the Americal Board of Medical Hypnosis. After December 31, 1959 all applicants, regardless of training and experience, will be expected to pass formal examinations and, in addition, to supply evidence of prior certification by one of the A.M.A controlled American Medical Specialty Boards. For pertinent information regarding the American Board of Medical Hypnosis, including data for physicians in general practice, contact the Secretary-Treasurer, Bernard B. Raginsky, M.D., 376 Redfern Avenue, Suite No. 2, Montreal 6, Que., Canada.

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The American Board of Medical Hypnosis is a division of the American Board of Clinical Hypnosis, Incorporated. It is sponsored by The Society For Clinical and Experimental Hypnosis and is affiliated with the Institute for Research in Hypnosis.

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The American Board of Medical Hypnosis announces that the following people have been appointed as members of the Board of Directors:

J. H. Conn, M.D. (Psychiatry)
Albert M. Betcher, M.D. (Anesthesiology)
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TEMPORARY CARDIAC ARREST INDUCED UNDER HYPNOSIS*†

BERNARD B. RAGINSKY, M.D.

Introduction

Interest in the diseases of the heart, organic and functional, dates back from time immemorial. At the beginning, this interest centered on the emotional aspects of "heart-ache", since it was the time before the physiology, anatomy and the circulation of the heart were known. Some of the observations made thousands of years ago implying that the heart was the seat of the emotions persist up to the present time. This paper dealing with temporary cardiac arrest induced under hypnosis is presented from an eclectic viewpoint.

Since the first description of coronary thrombosis in 1912 (14) many great contributions have been made in cardiology. These, however, have by no means exhausted the subject. With newer techniques, such as the use of the electron microscope, increased knowledge of electrolytic balance and revolutionary techniques in cardiac surgery, fresh discoveries have been following each other at an accelerated pace. In a major breakthrough last year, Hans Selye was able to prevent fatal heart attacks in 100% of his animals placed under stress by pretreating them with hormones and potassium chlorate.

The most recent discovery of far reaching importance and one which prompted the leading Editorial in the Journal of the American Medical Association (10) to call it "amazing", was the observation that mammalian hearts could be perfused with nothing more than a moist gaseous mixture consisting of oxygen and carbon dioxide by way of its coronary vessels and still maintain regular heart beats for more than three hours. (2) The circulation of gas instead of liquid is sufficiently startling in connection with a cold-blooded animal like the frog. That it should be possible also in warm-blooded mammals like the rabbit and that it should suffice for so active an organ as the heart seemed too much to expect.

The Editorial goes on to observe that "evidently the potentialities of living things have been underestimated. It is quite likely that the

* Presented at the Tenth Annual Scientific Meeting of The Society for Clinical & Experimental Hypnosis, Chicago, October 29th, 1958.

† The author is indebted to Dr. Wilder Penfield and Dr. H. N. Segall for their permission to examine the patient's hospital records, and to Dr. A. Lapin of McGill University for reading the ECG.

human heart, kidneys, liver, muscles, and brain can survive under conditions hitherto considered fantastic."

These experiments were based on an earlier set of observations carried out by Bunzl and his co-workers in 1954. (3) They studied the reflex activity of the frog's spinal cord by perfusing its vertebral canal through a cannula which admitted a humidified mixture of oxygen and carbon dioxide along with minimal amounts of Ringer's solution. A valuable by-product of this experiment was a simple demonstration that nitrous oxide differs sensibly from nitrogen in its effects on the cord. The same Editorial states: "This finding is a remarkably convincing and convenient proof that nitrous oxide is truly an anesthetic and not a mere asphyxiant."

In collaboration with Dr. Wesley Bourne, we were priviliged to prove this important point twenty-five years ago using other techniques. (27) (28) In patients under nitrous oxide anesthesia (80:20 mixture) for minor operations, we were able to measure the nitrous oxide and the oxygen content of arterial blood. The results of experiments on fourteen such patients proved for the first time that nitrous oxide was not an inert gas which produced anesthesia only through anoxia but that it was indeed an anesthetic per se.

The discovery of the real anesthetic property of nitrous oxide through two such diverse channels, proves once more that the frontiers of knowledge may be pushed forward from various angles and directions; that "amazing" and "remarkable" discoveries in medicine may come from the most unexpected disciplines. This point is pertinent to the experiment which is the basis of this communication.

We first became interested in the effects of drugs on the total cardiovascular system about thirty years ago. This led us to the realization that the effect of some drugs is different on different parts of the system. In order to test the effects of drugs on the cardiac output and the coronary flow, the heart-lung preparation of Starling was used. It was much more difficult to observe the action of drugs on the peripheral circulation, for to do this one has to remove the heart itself from the circulating system. This we were able to do in dogs by substituting the animal's heart with an electromagnetic mechanical heart. (29) Further experiments led to the discovery of an analeptic combination of pituitary extract and ephedrine capable of reviving a heart which had stopped for from two to three minutes. (30)

It was eleven years later that the opportunity of carrying out additional observations on the cardiovascular-brain relationships in man presented itself in the form of a medical condition in a patient, peculiarly suited to the experiment which is the basis of this paper. Most

discoveries in medicine could not have been deduced from existing knowledge and could not, therefore, have been arrived at by processes of reason alone. In the biological sciences one never has all the relevant facts available. There are nearly always alternative explanations for those we do have. As a result, the development of a discovery can be planned, but the original discovery cannot be.

An observation in medicine may have a half-dozen explanations, but fitting it to a preconceived hypothesis will exclude all explanations except one and gives the observer five chances out of six to be wrong. It is difficult to be loyal to the evidence. One must allow the ultimate supremacy of the facts over the most of our cherished preconceived views. A well-conducted experiment, designed to elucidate one problem may, in result, throw a brilliant light upon another. This turned out to be the case in this instance.

Experiment

The patient, a male, aged 65, presented himself in our office for the first time on October 5th, 1941, complaining of cough with expectoration, dyspnea on exertion and heartburn. He gave a history of seven various hospital admissions since 1936. The medical history pertinent to the experiment follows:

During the night of December 10th, 1939, he fainted from six to seven times within a period of a few hours. He remained unconscious for only one to two minutes on each occasion. There were no convulsions. During these attacks he also suffered from praecordial pain. He was admitted to the hospital immediately and was discharged four days later with a diagnosis of a Stokes-Adams syndrome (1) (35) and bronchial asthma.

The condition did not improve and on January 30th, 1940, he was admitted to the Neurological Institute. Their records show that electrocardiograms indicated that an arrest of the heart could be brought about on quite readily with carotid sinus stimulation. These asystoles had a duration of about 5–10 seconds, following which there was some disorganization in the electrical activity of the brain.

Following the injection of the right carotid sinus with nupercaine, pressure over this area did not produce asystoles. The next day a right sinu-carotid neurectomy was performed. As a result of this operation, the patient was unable to bring on either the fainting sensation or the actual attack. It was then decided that a similar operation on the left side should be performed at a later date. This was done on March 13th, 1940. Following these two operations, the record shows that he felt well and that pressure on either or both carotid sinuses produced no symptoms or electrocardiographic abnormalities.

Here, then, was an ideal set of circumstances for an experiment to show, if possible, that one could have a patient in the hypnotic state re-enact a previously emotionally charged situation with all the intensity of the original fainting episodes. His hospital records showed that he had had fainting attacks with loss of consciousness but no convulsive movements for six years prior to his visit to our office, but that he had had no such episodes since the bilateral sinu-carotid neurectomy operations were done, one and a half years before this visit.

The patient was asked if he would be willing to act as a "guinea pig" for the experiment. He was not told what was to be done except that he would be put in a hypnotic state. It was suggested that the results might be completely negative but that perhaps if we were fortunate enough we might learn something about the physiology and mechanisms involved and in this way it might be possible to help other patients in a similar situation. He was somewhat apprehensive and asked for a few days to think it over. He consented on the next day and the experiment was carried out on October 8th, 1941.

Approximately twenty minutes were spent in discussing hypnosis and hypnotic phenomena. He was then placed on the couch and connected up to the electrocardiograph. By great good fortune he responded well to the eye-fixation technique and went into a medium to deep hypnotic state. This state was fully developed in about half an hour but he was allowed to remain in that condition quietly for another twenty minutes so that the retreat from the day's happenings and the immediate present might be greater.

He was then asked to visualize earlier experiences of all kinds, but no mention was made of his symptoms. Random pleasant memories were brought to the surface and the patient appeared to go into a deeper hypnotic state. He was then asked to discuss some of his experiences with doctors, nurses, orderlies and hospitals. He started out with neutral memories but soon brought up unpleasant experiences of apprehension and anxiety. At this point he was asked to visualize with all clarity possible his worst attack of faintness. He became very restless and agitated but did not go into a faint. Evidence of this restlessness and agitation can be seen in Lead I in both the electrocardiogram and phonocardiogram. See Figure No. 1. It was then suggested that the memory of the situation would fade away and that he would become comfortable again.

At this point in the experiment we were of two minds as to the advisability of proceding further since it might become dangerous to do so. As he settled down very quickly with no evidence of a vasodepressive reaction it was decided to try once again and this time the electrocardiograph was turned to record Lead 2. It was then suggested that

he would see the same scene as before but even more vividly. The suggestion was given in a tone of considerable urgency. This time he did not become restless but suddenly turned pale, limp, and a cold perspiration appeared on his forehead. His pulse was unobtainable and needless to say it caused us concern. It was immediately suggested that the memory of the incident would fade away and that he would feel comfortable and well.

In a few minutes his colour, breathing and pulse returned to normal and he was allowed to rest for another ten minutes. At the end of that time he was asked how he felt and when he replied "Fine", it was decided to try the same suggestion once more with the patient connected to Lead 3 this time. The results obtained were exactly the same as on the previous trial and it was decided not to push our good luck further, as the possibility of any one of several cardiovascular accidents in a man of 65 seemed not only a possibility but, after the third trial, a probability. In view of this decision he was allowed to rest for another ten minutes and at the end of that time Lead 4 was recorded while he was still in the hypnotic state, with the suggestion to relax and to leave his mind as blank as possible.

While the electrodes and stethescope were being removed suggestions were given that he relax and go into a sound refreshing sleep. After resting for another few minutes he was awakened with the suggestion that he would be able to remember what he wished to remember of what had transpired.

He showed no great concern over what had happened and did not appear to remember too clearly the suggestions that had been given nor the episodes of syncope. His main concern seemed to be whether or not the experiment had been successful and would it throw any light on the subject for such other patients.

He was seen on two subsequent occasions during the same month in connection with the symptoms for which he had come, but which are not relevant to the experiment. On these two visits he did not refer to his experience under hypnosis except to say that he had "enjoyed" it. We never saw him again but followed his progress through his subsequent hospital records.

The first of these hospital admissions following this experiment occurred seven years later (December 5th–10th, 1948). He was discharged with a diagnosis of arteriosclerotic heart disease with flutter and fibrillation, chronic bronchitis and emphysema. He had four subsequent hospital admissions up to the time of his death in 1956 at the age of 81. He died of uraemia following a prostatectomy. At no time in any of his hospital admissions was an electrocardiogram taken which showed the

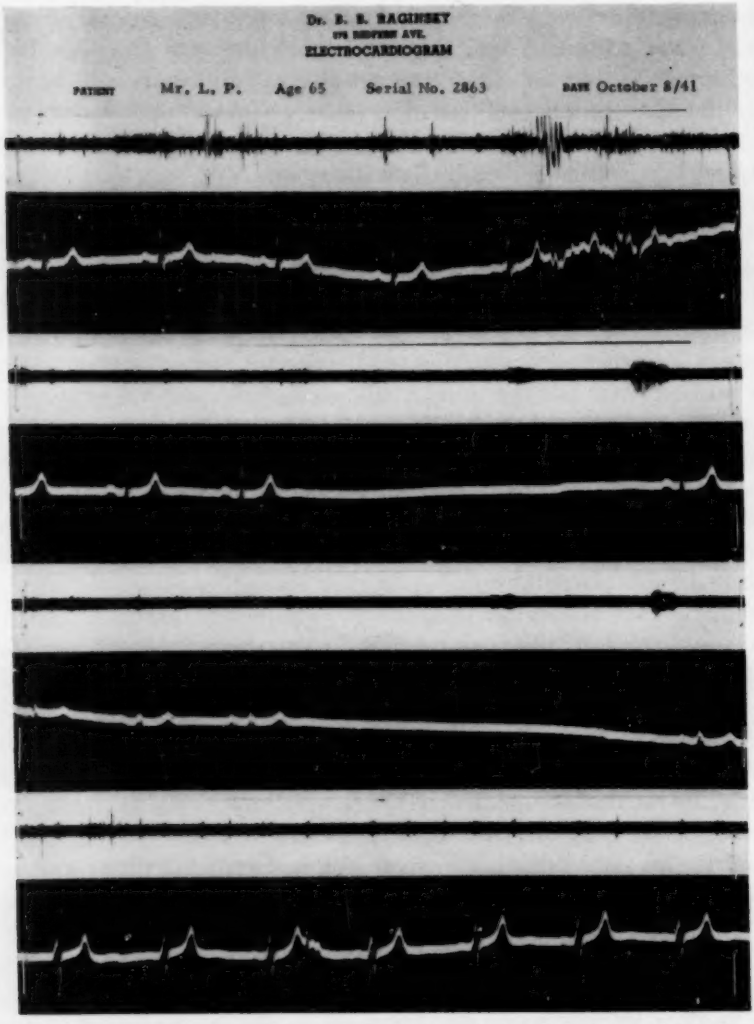

FIG. No. 1 Sinus bradycardia; rate 50–52 per minute. P-R interval just beyond the upper limit of normal. Two episodes of complete auricular and ventricular standstill: one of 4 4/5 secs. and one of 5 secs., each terminated by a normal sino-auricular beat. Normal electrical axis.

slightest trace of the complete cardiac arrest which was produced under hypnosis in this experiment.

Discussion

When the experiment was conceived, it was not contemplated that cardiac arrest would follow the suggested syncope. It was anticipated

that if a fainting episode could be induced under hypnosis some relatively minor electrocardiographic changes might be recorded. This supposition was based on observations we have made in the past while experimenting with the production and elimination of extrasystoles in hypnotic states (to be published later) and as reported by Schneck. (32) We were not at all prepared for the complete cardiac arrest which followed the hallucinated episodes. It would seem from the artifacts produced in Lead 1, when the patient was first told to visualize his fainting attacks, that he became upset and restless but did not attain a real "attack". It might be termed a simulated attack of faintness or at best a mild faintness. It was only when he suddenly blanched and became limp, as was apparent clinically, that he was really capable of "reliving" a previous attack. The electrocardiographic tracings in Leads 2 and 3 vouch for this state of affairs.

To our knowledge, the production of temporary cardiac arrest by means of hypnosis has never been recorded in the literature. To quote Paul Dudley White (38) in his textbook on Heart Disease—"Much has been written in the past about the Morgagni-Adams-Stokes syndrome, perhaps too much in view of its rarity. All grades of disturbance of the cerebral circulation may exist, from slight dizziness and faintness with transient ventricular standstill of two to three seconds duration, up to the extreme degrees of the syndrome with cessation of the heartbeat for as long as twenty or thirty seconds." Only one tracing is used in all four editions of his textbook, extending over a period of two decades, to demonstrate this syndrome, but it only shows the absence of ventricular systoles, the auricular systoles being still present.

The ability to produce temporary cardiac arrest with or without hypnosis after a bilateral sinu-carotid neurectomy had been performed made the diagnosis of Stokes-Adams syndrome suspect. This impression was strengthened ten years later by the following observation in the fourth edition of White's Textbook on Heart Disease, 1951. (38) "The clinical condition (Morgagni-Adams-Stokes syndrome) is similar to the result of the cerebral anemia occurring in some cases of extreme tachycardia or of atrial depression with standstill of atria as well as ventricles, but the mechanism is of course quite different and the prognosis and treatment not the same. It is better not to lump all these conditions into this one heading as has been somewhat the custom."

The remarkable change in heart function induced at the hypnotic level brings up many provocative questions involving not only hypnotic techniques but also the question of the learning process (12), conditioned reflexes and responses, the existence of cortical "patterns" that preserve the detail of current experience, and finally the elusive physiology of the "mind". In this particular experiment the question was also

raised as to the effect of surgical intervention in diseases having emotional components not readily demonstrable.

This patient made a complete recovery following the sinu-carotid neurectomy, remained symptom-free and pressure on the carotid area did not produce symptoms or ECG findings. And yet, hallucinated attacks induced under hypnosis not only reproduced the symptoms but created changes in the heart function greater than had been recorded at any time during his many admissions to hospitals, before, during and after his operations.

The experiment was finished. The results were clear and unequivocal. The meaning and interpretation of the results, however, were far from clear. It was 1941, eight years before a group of scientists was to form the Society for Clinical and Experimental Hypnosis, it was fourteen years before Wilder Penfield was to reveal his discovery that the record of the stream of consciousness could be reactivated by electrical stimulation of the cortex of the temporal lobes, it was sixteen years before the American Medical Association was to accept hypnosis as an integral part of medical training and therapy; in short, it was a time to consider the findings and wait.

Would another opportunity present itself of a patient suffering from the same medical condition? Would we be able to see him before and after operation? Could a satisfactory hypnotic state be induced? Would repetition of the experiment, even if successful, add to the knowledge of the mechanism involved? As time sped by we became less and less certain that we would take advantage of it if such an opportunity did present itself again. Either because of greater experience and possibly wisdom, or perhaps more because of lack of courage, we became less and less inclined to consider chancing a similar experiment as we became more aware of the real dangers to which the patient had been subjected. As it was, it was with considerable anxiety and later relief that we waited to learn how the patient fared during the following years.

This situation made us more acutely aware of the difference between the mathematical and physical sciences on the one hand, and the biological sciences on the other. The physical sciences are more dependent on reasoning and calculation, the biological ones on knowledge and experience. Hill's survey showed that the peak age of accomplishment for those in the biological sciences was twice that for mathematicians and physicists. (15) This observation should be of considerable interest and importance to students and teachers of hypnosis. There were other factors as well that made us content to wait and learn.

It is a common observation that people are allergic to new ideas. Discoveries are rarely received with undiluted enthusiasm. (21) This

is particularly true when the discovery impinges upon some vested interest or conflicts with the views of a scientific hierachy. Unacquainted with investigators in the field of hypnosis, we first showed the electrocardiogram to cardiologists in various cities for their opinion. Their initial interest in it turned, at times, to wonder and at other times to ridicule when the manner by which this effect was obtained was described to them. A distinguished scientist may be as irrational as anyone else, or even more so. He must combine exceptional inspiration with the most powerful intellectual machinery. But the fact remains that most scientists who become prominent do so mainly by virtue of other characteristics than the capacity for reasoning. The scientists who were first consulted certainly had no exceptional inspiration in hypnosis, scientific or otherwise.

Other recorded incidents made us content to wait and learn. As an example of the physical scientist, Newton had firmly laid the foundations of his immortal work by the time he was twenty-four years of age. Charles Darwin, by contrast, had some inkling of the theme of the "Origin of the Species" at the age of twenty-seven, but he continued to collect material and develop his ideas for another twenty years before putting them down on paper.

Closer to home and more pertinent to this experiment is the example of the distinguished neurosurgeon, Wilder Penfield. It was back in 1934 that he discovered that the record of the stream of consciousness could be reactivated by electrical stimulation of the cortex of the temporal lobes, but he waited for twenty-one years—1955—before presenting it to psychiatrists. (22) To quote him—"I have realized that here was material of considerable interest to psychiatrists. But I postponed presenting the material to them, realizing that, although the facts were obvious, their meaning in terms of physiology was obscure. And so I have waited year after year for the accumulation of more evidence."

During our own period of waiting we learned a great deal which made our findings more meaningful. The investigation of hypnotic phenomena by Schneck (33) (34), Kline, (16) (17) Guze, (12) (13) Rosen, (31) Dorcus, (5) Wolberg, (37) Erickson (11) and Watkins (36) opened up new avenues of knowledge and understanding.

Kline and Guze (18) showed that the oral temperature could not be affected in a subject by direct suggestion, by time regression, nor age regression. An oral temperature drop of 3° F. was effected only by an hypnotically induced hallucination of flying in a plane at an altitude of 100,000 feet. They found that the response of a subject to hypnotically motivated behaviour is not the mere result of acceptance of authority or of hypersuggestibility in itself, but the capacity to recognize

and accept communication that enters directly into the perceptual system.

In Kline's view, (17) retrogression constitutes a return to a fundamental state of being in which learning and the acquisition of all symbolic cues not only may take place on a subliminal level, but may be directly and rapidly incorporated into the open-circuited learning system created by the induction of hypnosis. The use of the hypnotic state creates an opportunity to facilitate changes in behavior ranging from such relatively superficial ones as relaxation to such extremely radical changes as neuropsychologic and physiologic reactions.

These findings make the experimental results described in this communication more meaningful. The learning and the acquisition of symbolic cues which are directly and rapidly incorporated into the open-circuited learning system under hypnosis justifies our original fear of repeating the experiment described, more than twice. Having repeated it within a period of about fifteen minutes, we were hesitant at the time of the experiment to do it more often since our work on conditioned reflexes and experimental neuroses in animals (6) (7) (8) and later in hypnotized subjects (20) indicated that archaic patterns of behavior could be re-instituted accidently or purposefully. In retrospect, it appears possible that by repeating the experiment often enough one might recreate spontaneously the symptoms the patient complained of prior to operation—a very dangerous possibility indeed.

The results of the experiment as described appear to fit in with Guze's hypothesis that the hypnotic state is a state of emotional readiness or reactivity, during which perceptual change can be introduced. In this way a variety of traumatic experiences, such as the patient's attacks prior to operation, leave their mark in a state of hypnotic nature. Since levels of consciousness exist, if not in an anatomical sense, in a functional integrative way, many persons may not show emotional or physical disruption unless they are submitted to stress. At such a time the subcortical factors may come to the fore. In pathology one deals with an organism in which certain "circuits" are facilitated and others inhibited. This will be discussed further in connection with Penfield's findings.

Kupper (19) describes a patient with a history of classical convulsive seizures of grand-mal type. His attacks, which started six years before examination, had been precipitated by an emotional upset. Under hypnosis, convulsive seizures were induced by discovering and suggesting the specific psychic conflict. The electroencephalographic recordings could be altered by suggesting, under hypnosis, that the patient regress

to an age prior to his first convulsion. This experiment has been repeated by others and bears some similarity to our own.

Platonow (26) and Dolin (9) suggest the theoretical rationale of regression to be that conditioned reactions, once developed, do not disappear completely, but leave organic traces in the nervous system. Hypnotic stimuli may reanimate earlier conditioned-response patterns. It was at this very time that Penfield made his historical discovery that stimulation of the temporal cortex occasionally produced a psychical response, something of a different order from the motor or sensory effects described before this discovery. At such times the patient continues to be aware of the fact that he is lying on the operating table and yet the recollection continues in spite of himself, as long as the electrode is kept in place, to vanish instantly when the electrode is withdrawn. (23)

The electrode applied to the temporal cortex, recalls specific occasions or events, so that the individual is made aware of everything to which he was paying attention during a specific interval of time. Such responses have followed stimulation only in cases in which the cortex had been the site of previous habitual epileptic discharges. Although the content of the recollection thus evoked often bears no relationship to the psychical content of the seizure, it is possible that the cortex has been rendered more readily stimuable by the epileptic state. In view of our reported experiment, is it possible to stimulate the temporal cortex in non-epileptics who have had other types of electric discharges repeatedly, and reproduce similar memories?

It is assumed that the right and left temporal lobes give similar service in this regard and that the memory record is duplicated on the two sides since removal of a large part of one lobe does not usually interfere with a man's capacity to recollect or to recognize the things seen before. Penfield believes that the neurone processes involved in the original creation of the record of present experience are those involved in the act of attention and that the instantaneous reprojection or reflection of the record back again together with some sort of reflection of previous similar experience constitutes an essential neurone mechanism in consciousness. It is obvious, he writes, that nerve impulse is somehow converted into thought and that thought can be converted into nerve impulse. And yet all this throws no light upon the nature of that strange conversion.

It seems to make little difference whether the original experience was fact, dream or fancy. The stimulating electrode recalls a single recollection, not a mixture of memories or a generalization as in ordinary

memory or as during psychoanalytic recall. Under the compelling influence of the stimulating electrode, the subject feels again the emotion which the situation originally produced in him and he is aware of the same interpetations, true or false, which he himself gave to the experience in the first place. Thus, by this method of recall, the evoked recollection is not the exact photographic or phonographic reproduction of past scenes and events. It is a reproduction of what the patient saw and heard and felt and understood. These memories are not fused with other, similar experiences. In this respect evoked recollection differs from normal recollection of the past, where single experiences may be indistinguishable from other similar experiences. (24)

These results of stimulation prove the existence of memory patterns; but how are they formed there and how are they used? The answers to these questions are of great psychological importance. Whenever a normal person is paying conscious attention to something, he is simultaneously recording it in the temporal cortex of each hemisphere. Every conscious aspect of the experience seems to be included in these cortical records. The arrangement of ganglion cells and their synaptic connections must form a relatively stable endowment, changing little with the passage of time. When the electrode is applied to the memory cortex, it may produce a picture, but the picture is not usually static. It changes as it did when it was seen originally and when the subject perhaps altered the direction of his gaze. It follows the originally observed events of succeeding seconds or minutes. (24)

The thread of continuity in evoked recollections seems to be time. The original pattern was laid down in temporal succession. It is the thread of temporal succession that later seems to hold the elements of evoked recollection together. If anywhere, the hypothetical integrating system is in the centrencephalic system. The circuits of this system run out to the various functional areas of the cortex and back again. The memory cortex forms one of these areas. The "place of understanding" is to be sought in the perfect functioning of all these converging circuits. But what is the bridge between nerve impulse and thought?

There are two psychical responses. One is a reproduction of past experiences and the other is a sudden alteration in interpretation of present experience. Thus the psychical responses to stimulation, taken together, may be divided into two groups. (25) *Experiential.* This has to do with the past and includes past events and past interpretation. These are "flash-back" phenomena. *Interpretative.* This has to do with the present. These may be "déjà vu" phenomena or the opposite. They are the disturbances of the present process of interpretation. There may be a false sense of familiarity such as in the "déjà vu" phenomenon;

or, on the contrary, everything may seem strange or absurd. The relationship of the individual to his environment may seem to be altered.

Both types of responses argue for the existence of a permanent ganglionic recording of the stream of consciousness. The record of that stream must be preserved in a specialized mechanism. Otherwise, experiential responses to an electrode applied locally would be impossible. It seems likely also, that appropriate parts of this same record are somehow utilized when recurring judgments are made in regard to familiarity and meaning of each new experience. It seems likely that under normal conditions the actual recording of the stream of consciousness may be utilized for the purpose of comparison long after it has been lost to voluntary recall.

The recording has strong visual and auditory components. It is always an unfolding of sight and sound and also, though rarely, of sense of position. The experience always goes forward. There are no still pictures. The evidence suggests that nothing is lost; that the record of each man's experience is complete. It might seem that the record of the stream of consciousness is more than a record. It represents one of the final stages in the neuronal integration which makes consciousness what it is.

How is this record formed and how is it preserved? Penfield surmises that there is a constant succession of impulses projected from the zone of central integration outward to the temporal regions, forming, among the millions of ganglion cells that cover the temporal lobes like a vast carpet, a continuous pathway. The pathway must undergo a physical change so that a simple electric current can follow it years later. Thus, present experience would be preserved for life. It would be preserved by means of successive facilitation through the cells and synapses which thus constitute the pathway. But it is a trail that can never be followed backward. It runs, like a one-way street, forward from any point at which stimulation makes an entrance into it. (22)

Penfield makes the observation that he has no means of knowing whether the methods of the psychoanalyst can re-activate the record with a completeness that rivals the electrode. He suspects that the patient who is being analysed brings up generalized memory or one that has been modified by his subsequent thinking or subsequent experience. Electrical recall is quite different from this, since it often produces random samples of true experience, which may have no particular significance in the life of the patient. (22)

The question which naturally comes to our mind at this point is whether hypnotic recall comes closer to electrical recall than any other form of recall. Tape recordings made of memory patterns of some pa-

tients under hypnosis tend to suggest some similarity between the two. For example, one patient in the hypnotic state was brought back to the age of five and without further direction or interruption on our part spoke continuously for one and a half hours reliving his life, always moving forward without once deviating from this direction. On the way, many minute observations were brought up which were confirmed later and of which he had no conscious recollection prior to the interview. Repeated interviews with this patient under similar circumstances brought out the same phenomenon. This has also been observed in a few other patients.

Since it has been demonstrated by Penfield that present experience is preserved for a life time by means of successive facilitation through the cells and synapses which constitute the pathway, it seems not too improbable that a non-electric stimulation may reactivate it. Could hypnosis be one of the agents to achieve this? Was this the pathway through which the temporary cardiac arrest was produced in our patient? Will future research into hypnotic phenomena aid us in answering the ultimate riddle—what is the bridge between nerve impulse and thought?

SUMMARY

An experiment is described in which the symptoms of syncope and temporary complete cardiac arrest were induced under hypnosis in a patient who had been operated on for a so-called Adams-Stokes syndrome and who had, until the time of the experiment, remained free of such symptoms. An attempt is made to correlate contemporary knowledge in explaining this phenomenon.

It is pointed out that maturity in the biological sciences takes about twice as long to achieve as does maturity in the physical sciences. This holds especially true in the use of hypnosis.

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A THEORY OF HYPNOSIS[1]

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The theory of hypnosis to be presented here was suggested from the results of some experiments carried out by the author (9).

The two basic assumptions underlying the theory may be outlined at first. These are (a) Hypnosis is a form of conditioning or in a broad sense, habit-formation; (b) Hypnosis is a form of inhibition.

(a) *Hypnosis is a form of conditioning.* Evidence exists that hypnosis has some essential similarity with conditioning. Probably the first to imply such a similarity was Pavlov (25). Hull too noted many similarities between hypnosis and conditioning (18). He considered hypnosis as a habit phenomenon and agreed with Pavlov who maintained that suggestion is "the most simple form of the typical conditioned reflex in man". Hull, like many after him, believed that ideomotor action was essential for hypnosis. The close association between ideomotor action and conditioning is indicated from the following quotation from Hull. "According to the present hypothesis, the physical substance of an idea is a symbolic or pure stimulus act. The proprioceptive stimuli arising from such acts, usually spoken words, are assumed when combined in certain patterns to have acquired during the previous history of the subject, through the process of association or conditioning, the capacity to evoke reactions of which they are the names" (18, pp. 393–399). The above quotation brings Hull very near to Pavlov's system (25, 26).

In a review of the literature on hypnosis, Young (31) emphasised the conditioned reflex explanation of hypnosis. He thought it as the most promising of the hypotheses advanced to explain hypnosis. Welch (30) also presented a behavioristic theory of hypnosis in which he argued that conditioning can explain hypnosis at least partially. Later, following his suggestion, an ingenious experiment was carried out (6). The results support their hypothesis that in hypnosis "abstract conditioning" is taking place. Furneaux (12) basing himself on the positive correlation between the Heat-Illusion Test and hypnosis also suggested that hypnosis and conditioning may be positively correlated; for he believed that the

[1] This paper is partially based on a Ph.D. thesis (9). The author is grateful to Professor H. J. Eysenck and Mr. W. D. Furneaux for their advice and guidance. Thanks are due to Drs. J. J. Sigal and M. I. Soueif for their critical reading of this paper in manuscript.

situation in the Heat Illusion Test is analogous to conditioning. Even Weitzenhoffer (27), who is not satisfied with a conditioned response explanation of hypnosis, accepts "abstract conditioning" as a basis of heteroaction. (Homoaction and heteroaction are the joint basis of hypnosis according to Weitzenhoffer.)

Although the *a priori* objections to a conditioned response explanation of hypnosis levelled by Weitzenhoffer (29) or Pattie (24) can be refuted, this will not be undertaken in this paper. (A discussion of this point may be found in (9).) It is sufficient to mention here that many divergent explanations of hypnosis can be shown to have some associations with conditioned response mechanisms. Ideomotor actions, heteroaction, imagery (22), to take only a few basic elements used by theories of hypnosis, have been related to conditioning.

It is surprising that no attempt was made in the past to demonstrate a correlation between hypnosis and conditioning. If conditioning furnishes even a partial explanation of hypnosis, a positive correlation between the two should be found.

As reported elsewhere (8), an experiment was carried out with the purpose of testing the existence of such a relationship. A correlation of 0.509 ($P < .001$) was obtained between acquisition of conditioned eyeblink and hypnosis. The correlation with extinction was similarly positive and highly significant (0.415, $P = .001$). Since our sample was not too small ($N = 63$) and the experiment did not appear to suffer from any obvious deficiencies, we accepted the obtained correlation as demonstrating a positive relationship between hypnosis and at least one form of conditioning.

(b) *Hypnosis is a form of inhibition.* Pavlov may be held to be the chief, but not the only advocate of the above view (25, 26). He considered hypnosis as a state of inhibition intermediate between wakefulness and sleep. His point of view would appear to be grossly misunderstood if sleep were held to be identical to hypnosis. The problem of the relationship between sleep and hypnosis has aroused long drawn controversies. Hull (17), Nygard (23), Gorton (16) and Pattie (24), for example, tend to support that hypnosis resembles a state of wakefulness, while Bechterew, Schilder and Kauders (28), Brown (5), Koster (21) and Barber (2) etc. suggest that hypnosis has some similarity with sleep. This problem has been discussed in some detail elsewhere (10). It need only be mentioned here that since hypnosis is intermediate between wakefulness and sleep, following Pavlov, it is consistent to find similarities in either direction depending on the conditions and depth of hypnosis. On the basis of many considerations, it was conlcuded that there was ample support to regard hypnosis as a state of inhibition. The results of a small

experiment carried out by the present author suggested that a state of inhibition can be induced in human beings by the application of monotonous stimuli (similar states were induced in Pavlov's dogs) and that such a state develops quickly with practice, showing tendencies to become conditioned to the inhibition-producing situation. It was also found that a *S*'s depth of hypnosis seems to be positively related to the development of such a state of inhibition (see 10).

The Theory

The above considerations lead us to think of hypnosis as a learned (or conditioned) state of cortical inhibition—the inhibition being selective, hence partial. It is different from a state of sleep because inhibition is only partial in hypnosis. The suggestions of the hypnotist largely determine the areas of inhibition and excitation in the *S*'s cortex. In these and in many other ways, it is different from a state of normal wakefulness.

Purely mechanically produced monotonous stimuli may induce a state of inhibition. But the task of the hypnotist is to select the cortical points to keep in a state of excitation, thus preventing inhibition from spreading over the entire cortex to produce sleep. The element of learning or conditioning involves past and present associations. The words used by the hypnotist have past associations; they are the parts of the *S*'s second signalling system in Pavlovian terms, and thus are symbols of symbols. When used by the hypnotist, they arouse past associations or traces. Learning is also necessary to develop a state of selective inhibition in accordance with the specific suggestions of the hypnotist and without falling asleep. With repeated hypnotic sessions, such a state of inhibition may be developed in a few seconds so that it may be conditioned to develop at a sign or signal.

Individual differences, however, exist in the ability to *learn* to develop a state of inhibition. Most probably, they exist in the initial level of cortical inhibition. We think, however, that the individual differences in hypnotizability within a normal population is more due to the differences in learning than in inhibition.

We would, therefore, like to define hypnotizability as an ability to learn to develop a state of partial cortical inhibition.

If H = Hypnosis, L = Learning (conditionability, habit formation etc.) and I = partial cortical Inhibition, we may propose that in an an ideal situation,

$$H = f(L \times I)$$

Suppose L has to reach a lower threshold, L_t, and I a lower threshold I_t, if $H = f(L \times I)$, then

$$L \geqq L_t \quad \text{or} \quad (L - L_t) \geqq 0$$

and

$$I \geqq I_t \quad \text{or} \quad (I - I_t) \geqq 0$$

Let us also suppose that I has an upper limit, I_u, when initial inhibition is so high that no learning is possible and sleep is induced instead of hypnosis, hence

$$I < I_u, \quad \text{or} \quad (I_u - I) > 0.$$

I_u may be best understood as a diffused cortical inhibition spreading all over the cortex. It may have been aroused in any possible way (chronic drug addiction, destruction of most of the sensory organs or severe brain damage etc., see 19).

A reversal of the above relationships makes $H = 0$.

Examples

(1) $H = 0$ if $(I_t - I) > 0$.

When a stimulant like dexedrine is given to S in an adequate dose, inhibition tends to be very low, so that

$$I < I_t.$$

Hypnosis cannot be induced in such a state.

(2) $H = 0$, if $(I_u - I) = 0$.

When a heavy dose of a depressant drug like sodium amytal is given to S,

$$I \rightarrow I_u$$

Hypnosis cannot be induced, S tending to develop sleep.

(3) $H = 0$, if $(L_t - L) > 0$.

A severely mentally deficient S, for example, an idiot, is unhypnotizable because his learning ability is very low and perhaps because his second signalling system (symbolic activity) is not adequately developed. The verbal suggestion of the hypnotist would not be effective for the second reason.

The values of I_t, I_u and L_t may have to be determined for every individual.

Let us give some other examples of how several other phenomena in hypnosis can be explained with the help of our theory.

(a) Any factor that increases learning ability tends to increase hyp-

notizability, though not under all conditions. Cooperation on the part of the *S* may facilitate hypnosis because of increased motivation to learn.

For, if $H = f(L \times I)$ and $H' = f[(L + \Delta L)I]$, where ΔL = a small increment in L, then, under certain conditions,

$$H' > H.$$

(b) In some cases, hypnosis could be induced more easily with the help of sedative drugs given in low dosage.

Increasing the monotony of stimulation also facilitates hypnosis because it increases the amount of initial inhibition. Both are consistent with the above formulation, for, as above, if

$$H = f(L \times I)$$

and

$$H' = f[L(I + \Delta I)]$$

where ΔI = a small increment in I,

$$H' > H.$$

The relation between L and I needs some more elaboration. L and I are not completely independent of each other. For learning or conditioning (L) to be possible, initial cortical inhibition (I) should be well below a maximum limit (I_u). On the other hand, some inhibition is needed for learning or conditioning to take place. For example, under heavy doses of sodium amytal or similar depressants, conditioned responses are hampered and disappear (14, 15). So also under extreme excitation (therefore, low inhibition) as may be produced by an administration of a stimulant, complex learning or differential conditioning may become poorer. With intermediate ranges of inhibition, learning is neither facilitated nor deteriorates. It can be expressed thus:

If $I < I_t$, $\quad L \rightarrow 0$

If $I \geqq I_u$, $\quad L \rightarrow 0$

But, when $I_t < I < I_u$, L tends to be unaffected.

The differential effects of differing doses of depressants on conditioning and hypnosis can be predicted. Let us choose three increasing doses (low, medium, high) of sodium amytal or any other equivalent depressant to be administered to a group of *S*s. We can then predict that with the low dose, hypnosis will be facilitated (i.e., induced more quickly) but conditioning may or may not deteriorate. With the medium dose, hypnosis may or may not be facilitated, but conditioning will deteriorate. With the high dose, both hypnosis and conditioning will definitely de-

teriorate so much so that neither of them may be brought about. The prediction may be summarised as follows:

Dosage of Depressant Drug		Predicted effect
Low	$I_i < I \ll I_u$	Conditioning may or may not deteriorate; hypnosis facilitated
Medium	$I_i \ll I < I_u$	Conditioning deteriorates; hypnosis may or may not be facilitated
High	$I_i \ll I \rightarrow I_u$	Both conditioning and hypnosis will deteriorate

How does our theory explain those forms of waking suggestibility which have a high positive correlation with hypnotizability? The Body-Sway Test (17, 11) and the Heat-Illusion Test have been shown to correlate highly with hypnosis. Eysenck (11) and Furneaux (13) have obtained, on more than one occasion, correlations around 0.70 with Body-Sway Test and around 0.50 with the Heat-Illusion Test. But the two tests have a negligible correlation with each other (11). We would like to hypothesise that while the Body Sway suggestibility score is largely a function of inhibition (I) and the past association part of learning (L), the Heat-Illusion Test score indicates a kind of sensory conditioning and hence depends on the present ability to condition, a part of L not involving reactivation of past associations. The situation in the Body-Sway Test is, in some ways, typical of an inhibition-producing environment. Hull reported that some of his *S*'s felt drowsy during and after the test (17). We too obtained similar findings from *S*s' introspective reports after Body Sway (9). As the *S* stands relaxed, his perception greatly limited by asking him to close his eyes and to concentrate on the repetitive suggestions of the experimenter, so the suggestion tends to have a greater effect. It is wrong to suppose that Body Sway suggestions, no matter how they are given, will still yield scores which have the usually obtained high and positive correlation with hypnosis. Barry, McKinnon and Murray (3) found that only when *S*s are instructed to assume a relaxed state did body sway suggestibility correlate highly with hypnotizability. From the above considerations, the high correlation between Body-Sway Test and Heat-Illusion Test on the one hand and hypnosis on the other as well as the lack of correlation between the two tests appear to be consistent with our theory.

From the standpoint of the present theory, hypersuggestibility during hypnosis does not describe the primary nature of hypnosis, which is a learned state of inhibition. A deep state of hypnosis is characterised by a relatively intense cortical inhibition in parts of the cortex, and excita-

tion in other parts consistent with the suggestions of the hypnotist. It is also characterized by an ability of cortical points to shift from a state of excitation to inhibition and vice versa in keeping with the hypnotic suggestions. Post hypnotic behaviour displays the lingering effects of the suggestion of the hypnotist in retaining the appropriate points of excitation and inhibition for the execution of the suggested act. This is consistent with the widely held belief that the *S* passes into a temporary trance during the carrying out of post hypnotic suggestions. Surely it requires learning (i.e. training) to develop such a highly selective and intense state of inhibition. Therefore, deep hypnosis usually needs more than one session to be induced.

In concluding, we would like to point out that besides explaining the results of our investigation, the present theory yields some testeable hypotheses. In that sense, it is neither merely an ad hoc (1) nor a barren theory (7). Unlike some other theories (e.g. Sarbin's theory; 27) its primary aim is to explain the hypnotic behaviour rather than to connect hypnosis with other psychological phenomena. Nevertheless, it emerged that hypnosis can be linked to learning. At this stage we are not clear about the status of L, as used in our theory. The existence of a general factor of conditioning or learning is not yet certain (20). Nor have we answered the question of the relationship between our L and Hull's $S^{H}R$ or our I and Hull's I_R (18).

Still, it is hoped that the present theory may serve as a guide to the direction in which a true explanation of hypnosis may be discovered.

Summary

The present theory of hypnosis assumes two things—that hypnosis is a form of conditioning and that it is a state of inhibition. Evidence relevant to the assumptions is presented briefly. The theory views hypnosis as a learned state of partial cortical inhibition and formalises it as a multiplicative function of learning and inhibition: $H = f(L \times I)$. Some predictions are made and explanations provided for several phenomena associated with hypnosis. The orientation of the theory is Pavlovian.

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ELECTRICAL SKIN CONDUCTANCE AND GALVANIC SKIN RESPONSE DURING "HYPNOSIS":

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To what degree is the hypnotic subject "involved" in the hypnotic situation? When is the subject passively agreeing with the hypnotist's suggestions and when is he actively "aroused" by the hypnotic procedure?

The degree of "involvement" or "arousal" can be indirectly measured; as the subject becomes more "aroused" there is a shift on the electroencephalogram from synchronized slow waves to a lower amplitude, fast-activity pattern, blood pressure and respiration increase and become more variable, muscle tension rises, and skin conductance increases. Although we can indirectly study the total event—organismic "arousal"—by studying any one or a combination of these participating processes, the most sensitive single indicator of increased "arousal" is an increase in the subject's electrical skin conductance.[2]

A number of investigators have studied the variations in skin conductance during "hypnosis."[3] However, they report contradictory results:

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[2] In a recent review and analysis of electrical skin conductance, Woodworth and Schlosberg (24, chapter 6) conclude as follows:

The absolute level of conductance ... seems to be a good measure of the general level of activation, for conductance is high when O (the subject) is alert and low when he is relaxed. It has no special name, although it is sometimes called *basic conductance* ... On the other hand, the rapid changes in conductance level ... *galvanic skin response* (GSR) ... simply measures momentary and brief activation, a transient burst that anticipates increased demands on O (the subject) (24, pp. 137–138).

In a series of papers (e.g., 16), Duffy has emphasized that increased skin conductance is *one component* of an *organismic* increase in "level of activation," "degree of arousal," or "extent of excitation."

[3] Although earlier investigators usually studied electrical skin *resistance*, we are reporting their results in terms of electrical skin *conductance*. A series of studies (summarized by Woodworth and Schlosberg (24)) indicate that *conductance* (the reciprocal of *resistance*) is the best unit for measuring the electrical skin response.

Estabrooks (18) reports that skin conductance decreases to a very low value during "the hypnotic state"; Levine (20) concludes that "hypnosis" does not significantly alter skin conductance; and Davis and Kantor (15) report that conductance increases during "active hypnotic states" and decreases during "passive hypnotic states."

To resolve the contradictions in the earlier studies and to acquire supplementary data, we carried out a series of experiments in which we recorded (a) the basic skin conductance (as an indicator of the subject's general "level of arousal" during "hypnosis") and (b) momentary increases in skin conductance—i.e., the galvanic skin response (GSR)—(as an indicator of momentary increases in "arousal" during specific "hypnotic tests").

Method

Subjects

Six college students—three males and three females—participated in these experiments. They were all "good" hypnotic subjects (Ss): (a) they had originally been chosen from a group of over 60 students as the "best" hypnotic Ss; and (b) they had participated in a number of preliminary experiments in which they had "experienced" "hypnotic dreams," "age-regression," "visual and auditory hallucinations," "alternate personality," "amnesia," and "post"-hypnotic behavior.

Apparatus

For measuring skin conductance we used a galvanometer as described by Woodworth and Schlosberg (24, p. 139). This consists of a 1½ volt flashlight battery in series with a microammeter, having a range of 100 microamps, two silvered electrodes, a calibrated resistor and a variable resistor. The calibrated resistor is connected to a switch providing for ranges of sensitivity of ratios 10:5:2:1 and a variable resistor permitting fine adjustment within a given range.

Procedure

The S was asked to sit in a comfortable soft-chair in a well-lighted room. A mixture of equal parts of bentonite (white clay) and glycerin was spread about one sixteenth inch thick on the S's palms to improve electrode contact. The electrodes from the galvanometer were then attached to the S's palms and a record was made of his basic skin conductance. Before beginning the hypnotic experiment a record was also made of the S's galvanic skin response to a pinprick. After a three minute pause—allowing skin conductance to again approach the preliminary level—the S was given a ten-minute "hypnotic induction procedure" as

described elsewhere (1, 2, 3, 4).[4] He was then given a series of "hypnotic tests," viz., "sensory hallucinations," "analgesia," "age-regression," "negative hallucinations," and "post"-hypnotic suggestions.

Skin Conductance during the "Hypnotic Induction Procedure"

As Table 1 indicates, three Ss showed an increased skin conductance and three Ss showed a decreased conductance during the "hypnotic induction procedure." However, in each case the alterations were slight and not statistically significant.

Discussion

Although the Ss were told over and over, for ten minutes, that they were becoming "relaxed . . . comfortable . . . drowsy . . . sleepy, etc." the insignificant variation in skin conductance indicates that they did *not* become more "relaxed" or less "aroused." These results are surprising *if* the "hypnotic patter"—i.e., the words "relaxed . . . drowsy . . . sleepy, etc."—was the only variable affecting the Ss' "degree of arousal" during this period. However, since these Ss had previously participated in a number of hypnotic experiments, they were aware that they would soon be given "active" suggestions. We can therefore hypothesize that there were at least two antagonistic factors affecting their "degree of arousal" during the "hypnotic induction" period: (a) the suggestions to become "relaxed . . . drowsy . . . sleepy," and (b) their knowledge, from previous hypnotic experience, that they must remain alert and ready to carry out the "active" suggestions which would soon be given.[5]

[4] This "hypnotic induction procedure" consisted of variations on the theme of "comfortable . . . relaxed . . . drowsy . . . everything is fading away . . . can't think of anything at all . . . so drowsy . . . so sleepy, etc." The S was never "challenged" during the procedure; e.g., he was *not* asked to "try and open your eyes, you can't do it," or, "try to move your leg, you'll notice it's impossible to do so."

[5] The lack of significant variation in skin conductance during the ten-minute "induction procedure" indicates that a "hypnotic induction" may not be necessary with "good" hypnotic Ss. This is perfectly correct! In experiments to be reported in a forthcoming book by one of us (T. X. B.), *Hypnosis, Perception, and Psychosomatics*, 8 "good" hypnotic Ss were given a one-minute "hypnotic induction procedure" and 2 "good" hypnotic Ss were not given *any* "hypnotic induction"—they were simply told, "Put yourself in hypnosis. Take your time and let me know when you are in hypnosis." (Within a minute these two Ss stated that they were "in hypnosis.") All of these Ss subsequently responded in a "somnambulistic" manner when given tests of "catalepsy," "age-regression," "visual hallucinations," "amnesia," and "post"-hypnotic behavior. *We should critically examine reports stating that a "good" S, who had participated in previous experiments, was "hypnotized" by means of such and such an "induction procedure." Was the "induction" necessary or was the subject ready and willing—i.e., "set"—to carry out the suggestions if the "hypnotist" had simply said, "Put yourself in hypnosis?"*

TABLE 1
Skin Conductance During The Hypnotic Experiment
(In micromhos)

Subject	First reading (before experiment)	Immediately before "hypnotic induction procedure"	Middle of "hypnotic induction procedure"	At end of "hypnotic induction procedure"	Immediately before command to "wake up"	Immediately after command to "wake up"	Immediately after "post"-hypnotic behavior
BF	15	27	29	26	29	42	35
JB	16	17	15	18	36	42	46
ACS	23	27	24	23	38	52	53
LP	16	18	18	19	14	16	15
JS	18	18	16	15	27	38	41
MR	23	24	25	25	30	31	30
Mean	18.5	21.8	21.2	21	29	36.8	36.7

Skin Conductance during the "Active" Hypnotic Tests

After completing the "induction procedure", the Ss were given a series of "hypnotic tests"—"pinprick analgesia," "sensory hallucinations," "age-regression," and "negative hallucinations." Skin conductance generally increased during this period of approximately 35 minutes. As Table 1 indicates, skin conductance, with the exception of one S, was higher at the "end" of "hypnosis"—i.e., immediately before the command to "wake up"—than it was at the termination of the "induction procedure." (Although one S showed a decreased conductance, the average skin conductance increased from 21 micromhos to 29 micromhos. This falls just short of significance at the 0.05 level.)

As Table 1 also indicates, skin conductance increased when the Ss were told to "wake up"[6] and it remained high during the "post"-hypnotic period. On the average, conductance increased approximately 100 per cent from the first reading (recorded soon after the S entered the room) to the last reading (recorded immediately before the S left the room).

Discussion

As the experiment continued, five of the six Ss became more and more "aroused" and more and more "involved" in the hypnotic situation. They entered the experimental room relatively "relaxed" and "un-

[6] The significant increase in skin conductance when the Ss were told to "wake up" can be accounted for, to a great extent, by "eye-opening." In preliminary studies and during the hypnotic experiments we found that, with rare exceptions, the act of opening the eyes in a lighted room (after they were closed for a period of time) resulted in an increased conductance.

excited"; their "level of activation" increased with each "active" suggestion and it continued to increase during the "post"-hypnotic period; when they were ready to leave the experimental room, they had reached a high level of "arousal," "excitement," and "activation." Previous reports that "hypnosis" is a "passive," "trancelike," "peaceful," "state" are incomplete and misleading. *The hypnotic subject does not necessarily become "passive" and "relaxed": he can become—and he often does become—very much "aroused," "excited," and "activated" during the experiment.*

Since previous studies of skin conductance during "hypnosis" are based on the fallacious assumption that "hypnosis" is some kind of "state" which a subject is either "in" or not "in,"[7] they are difficult to relate to our findings. However, we may be able to relate our results with the results of these earlier studies if we rephrase their static concepts in terms of the behavioral events to which they refer. (Our revisions are in parentheses.)

Estabrooks (18). Most hypnotic Ss (who have not previously participated in many hypnotic experiments and who are not especially "good" hypnotic Ss) show decreased skin conductance when "in the hypnotic state" (i.e., after a "hypnotic induction procedure"—time unspecified—which includes few if any "active" suggestions).

Levine (20). Some Ss show an insignificant increase in skin conductance and some Ss show an insignificant decrease in skin conductance when they are "in the hypnotic state" (i.e., when they are given a "hypnotic induction procedure"—time unspecified—which includes suggestions of relaxation and sleep and then are given a few "active" suggestions such as "paralysis of eyelids," "catalepsy," and "anesthesia to pain and touch"). (Levine's Ss were "poor" hypnotic Ss; in most instances, they did *not* carry out the "active" suggestions.)

Davis and Kantor (15). Hypnotic Ss (whether "good" or "poor" not indicated) show (a) decreased skin conductance when in a "passive hypnotic state" (i.e., after a "hypnotic induction procedure" that includes suggestions of sleep but does not include "active" suggestions) and (b) increased skin conductance when in an "active hypnotic state" (i.e., when they are given "active" suggestions such as "paralysis of arm and leg" and "verbal aphasia").

[7] As pointed out elsewhere (5, 6, 8, 10, 11, 12, 13) this fallacy of reification has been the bane of hypnotic theory for more than 100 years. "Hypnosis" is not a "state of consciousness." It is not something that can be "entered." It is not located "within," "outside," or "around" the subject. It is not located anywhere! "Hypnosis" is a descriptive *abstraction* referring to a certain type of *behavior* in a certain situation. Our understanding of this behavior will remain nil as long as we uncritically assume that this abstract term has existential reality.

Barber and Coules. "Good" hypnotic Ss who have participated in previous hypnotic experiments usually show (a) insignificant changes in skin conductance during an inactive "hypnotic induction procedure" and (b) increasing skin conductance during the remainder of the experiment when they are given "active" suggestions of "sensory hallucinations," "pinprick analgesia," "age-regression," "negative hallucinations," and "post"-hypnotic behavior.

The results of these studies are contradictory *only if* we interpret them in terms of something called "the hypnotic state." If we interpret them in terms of the behavioral events which actually occurred they are in agreement as follows:

1. Hypnotic subjects show increased skin conductance when they *carry out* "active" suggestions.

2. When given "passive" suggestions, hypnotic subjects may show insignificant variations in skin conductance or a decrease in skin conductance. (Whether they show insignificant changes or a decrease in conductance seems to depend on a number of variables *which are often not reported*; e.g., the previous hypnotic experience of the subject and his "expectations" concerning the forthcoming suggestions, whether the subject was sitting up or lying down, whether the room was dark or well lighted, the length of time of the "induction procedure," etc.)

The GSR during "Sensory Hallucinations"

As stated above, basic conductance was usually at a higher level after each "hypnotic test." There were also momentary increases in skin conductance—i.e., galvanic skin responses—to many specific suggestions. For example, as Table 2 indicates, skin conductance usually showed a momentary increase immediately after the Ss were given each

Table 2
GSR During "Sensory Hallucinations"
(In micromhos)

Subject	"Itch"	"Thirst"	"Heat"
BF	14	*	*
JB	1	0.5	1
ACS	5	3	4
LP	2	2	2
JS	2	5	0
MR	4	1	1
Mean	4.7	2.3	1.6

* Suggestions of "thirst" and "heat" were not given to this subject.

of the "sensory hallucination" suggestions, i.e., immediately after they were told the following:

(a) "Notice how your arm is beginning to itch at this spot. (The experimenter (E) touches S's arm.) It will itch more and more. It will become more and more bothersome."

(b) "Notice how your lips are becoming very dry. They are beginning to stick together. The saliva is going away from your mouth. You are becoming very thirsty. So thirsty. So dry and thirsty."

(c) "I am going to turn the heat up in this room. (E goes to the radiator and noisily pretends to be increasing the heat.) It's becoming very hot. The heat is increasing each moment."

Discussion

The Ss usually commented that they "itched terribly," that they became "very thirsty," and that they "felt hot." The increased skin conductance indicates that their behavior was more than verbal agreement with the hypnotist; they became relatively "aroused" and "excited" during the hallucinatory behavior.

The GSR during "Hypnotic Analgesia"

As Table 3 indicates, "hypnotic analgesia" did not significantly affect the GSR to a pinprick. The GSR to the pinprick was essentially the same before "hypnosis" and during "hypnotic analgesia," i.e., after the S was told over and over for two minutes that his leg was "dead . . . dull . . . numb . . . completely insensitive . . . cannot feel pain . . . cannot feel anything at all."[8]

However, this finding, by itself, is misleading: as Table 3 also indicates, there was no significant difference in the GSR, during "hypnotic analgesia," when (a) three Ss[9] were expecting a pinprick but did not receive the pinprick—i.e., when they were told, "I am going to stick a pin in your leg," but were not stuck with a pin, (b) when they were both expecting a pinprick and received a pinprick, and (c) when they received a pinprick without being told that they were going to be pricked.

[8] Immediately after the pinprick (during "hypnotic analgesia") subject *ACS* opened her eyes and stated: "I'm sorry, I should have told you before. I can't stand needles. I have an aversion to them. Please don't use that needle anymore, I can't stand it." The E reassured the S, asked her to close her eyes, repeated for a few moments that she was becoming "drowsy . . . sleepy . . . going sound, sound asleep" and then continued with the test for "negative hallucinations." After the experiment the S reported that she has been "afraid of needles since childhood" and has "for many years avoided all shots and injections."

[9] This test was introduced into the experimental design after we had completed the experiments with the first three subjects.

Table 3

GSR To Pinprick

(In micromhos)

Subject	Pre-"hypnosis"	"Hypnotic analgesia"
BF	8	7
JB	5	11
ACS	9	7*
LP	1	2
JS	4	2
MR	1	1
Mean	4.7	5

Subject	Threat of pinprick	Threat plus pinprick	Pinprick alone
LP	0.5	0.5	1
JS	3	2	2
MR	1	1	1
Mean	4.5	3.5	4

* S opened her eyes immediately after pinprick.

Discussion

Before "hypnosis" the Ss stated that the pin "hurt somewhat," it was "kind of painful," etc. During "hypnotic analgesia" they stated that "it didn't hurt at all," "it felt like a touch," etc. However, the GSR was not significantly altered. Most previous investigators have also reported that the GSR to a noxious stimulus is not significantly altered during "hypnotic analgesia" (14, 17, 21, 22). Nevertheless, this finding is *not* necessarily valid for all hypnotic Ss: West *et al.* (23) report that *some* "hypnotically analgesic" Ss at *some* times do *not* show a GSR to *some* noxious stimuli.

The second part of this experiment indirectly confirms Levine's (21) finding that the GSR is present when the S "hallucinates" being stuck with a needle. This experiment also tends to confirm Furer and Hardy's (19) conclusion that the GSR is a measure of the "threat-content" of the stimulus and not a measure of "pain" as such. *Previous studies which have measured GSR during "hypnotic analgesia" should be reevaluated. The GSR does not necessarily indicate that the subject "feels pain"; it can more profitably be interpreted as indicating that the subject is "threatened" by the stimulus or that he "expects pain."*

Table 4
GSR When Asked To Look At The "Negatively Hallucinated" Person and Object
(Average of 3 trials. In micromhos.)

Subject	Person	Object
BF	6	8
JB	4	1
ACS	2	3
LP	5	0
JS	10	2
MR	0	0
Mean	4.5	2.3

The GSR during "Negative Hallucinations"

Procedure

The following maneuver was utilized to lead the S to believe that a wastebasket was no longer present in the room: The E stated, "I'm going to rearrange things in this room. For example, I'm going to remove the wastebasket. (The E noisily lifted the basket, opened the door, placed it outside the room and then brought it back as quietly as possible.) I'm not going to tell you what else I'm going to rearrange."

The S was asked to open his eyes and the E alternately pointed at four objects in the room, including the (supposedly) absent wastebasket, and, in each case, asked the S to describe "what he saw and how it appeared." (This procedure—i.e., pointing to the objects and asking the S "what he saw"—was repeated three times.)

In a later part of the experiment, one of the Es stated, "I have to leave for awhile. I'll be gone for about fifteen minutes"; he then walked out of the room and returned, as quietly as possible, when the other E was saying to the S: "I want to see how things appear to you when you open your eyes during hypnosis. Dr. ——— has left the room, so, of course, you won't see him. Other things may also appear different." The S was asked to open his eyes and the E pointed at three objects in the room and at the (supposedly) absent E and asked the S to describe "what he saw and how it appeared." (This was also repeated three times.)

Results

As Table 4 indicates, four Ss showed a GSR each time they were asked to look at the "absent" E and at the "absent" wastebasket. However,

one S did *not* show a GSR at any time when she was asked to look at the "absent" basket, although she did show a GSR each time she was asked to look at the "absent" E. Another S *never* showed a GSR when asked to look at either the (supposedly) absent E or at the (supposedly) absent wastebasket.

Discussion

The four Ss who showed a GSR each time the E pointed at the "negatively hallucinated" person and object later admitted that they "somehow" saw the person and object; e.g., "I could kind of see the wastebasket vaguely. It seemed to be fading. It was very blurry." Subject *LP*, who showed a GSR each time she was asked to look at the "absent" E but never showed a GSR when asked to look at the "absent" wastebasket, later admitted that she saw the E but insisted that she did not see the basket; e.g., "Was it (the wastebasket) there? I didn't see it. I'm sure you must have removed it. I saw the wall there. I really thought it was outside. I remember seeing Dr. ——— but I'm sure I didn't see it." Subject *MR*, who never showed a GSR when asked to look at either the "absent" E or at the "absent" basket, later insisted that she did not see either the E or the basket and that she was "sure they weren't in the room."

These results indicate that many hypnotic Ss "perceive" (i.e., respond to) the "negatively hallucinated" object; however, they also indicate that *some* hypnotic Ss do not respond to the "negatively hallucinated" object on at least two "levels"—the verbal level and the autonomic level.[10]

The GSR during "Post"-Hypnotic Behavior

First "post"-hypnotic suggestion

Four of the Ss were given the "post"-hypnotic suggestion, "Whenever I light a cigarette your head will itch." They were also told that they would not remember this suggestion.

Results

As Table 5 indicates, three of the four Ss showed a GSR *at the moment* when E extended his hand to reach for a cigarette. They also showed a GSR when E lit the cigarette.

Second "post"-hypnotic suggestion

All six Ss were given the "post"-hypnotic suggestion, "Everytime you hear the word 'trance' you will blink your eyes." They were also told that they would not remember this suggestion.

[10] This experiment together with three others is included in a recent analysis of hypnotically-induced "negative hallucinations" (9).

Table 5
GSR During First "Post"-Hypnotic Suggestion
(In micromhos)

Subject	Immediately before "post"-hypnotic signal: E reaches for cigarette	"Post"-hypnotic signal: E lights cigarette
ACS	3.5	1
LP	0	0
JS	4	5
MR	2	2
Mean	2.4	2

Table 6
GSR During Second "Post"-Hypnotic Suggestion
(In micromhos)

Subject	Non-critical word: "hypnosis"	Critical word: "trance"
BF	0	6
JB	1	2
ACS	0	1
LP	0	1
JS	0	4
MR	0	0
Mean	0.17	2.3

$t = 2.96$

$P = <0.05$

Results

As Table 6 indicates, five of the six Ss showed a GSR when they heard the word "trance."[11] Only one S showed a GSR when he heard the related word "hypnosis." The mean difference of the GSRs to the critical word "trance" and to the non-critical word "hypnosis" is significant at the 0.05 level. All of the Ss stated that they did not "remember" the "post"-hypnotic suggestion (or anything else about the "hypnosis").

Discussion

Most of the Ss showed a GSR, i.e., became momentarily "aroused" and "excited", when E gave the signals for the "post"-hypnotic acts—when E lit the cigarette and when he spoke the word "trance." How-

[11] Although all of the Ss "blinked" when they heard the word "trance," eye-blinking, by itself, does not result in a GSR.

ever, most of the Ss also became momentarily "aroused" immediately *before* they were given the signal for the "post"-hypnotic behavior, that is, when the E first extended his hand to reach for the cigarette. These results tend to confirm an earlier observation (7) that hypnotic Ss often behave as if both the signal for the "post"-hypnotic act and the E's preliminary movements for giving the signal have special significance for them despite their statements that they do not "remember" the "post"-hypnotic suggestion.[12]

Summary and Conclusions

Six "good" hypnotic Ss were given a ten-minute "hypnotic induction" and a series of "hypnotic tests." Both basic skin conductance and momentary variations in skin conductance (GSR) were recorded during the experiment.

The results were as follows:

1. There was no significant variation in skin conductance during the "hypnotic induction procedure."

2. Skin conductance generally increased throughout the remainder of the experiment, i.e., when the Ss were given suggestions of "sensory hallucinations," "age-regression," "analgesia," "negative hallucinations," and "post"-hypnotic behavior.

3. The Ss usually showed a GSR when they were given "hallucina-

[12] In these earlier experiments 7 Ss were given the following suggestions:

(a) "You will have to stand up and walk around the room when I light a cigarette and you will not be able to sit down again until I put out the cigarette."

(b) "You will not be able to remember anything about the hypnosis."

(c) "As I count to five you will wake up."

The results reported in this earlier study were as follows:

When the experimenter gave the signal for the "post-hypnotic" act the subjects were aware that the signal (i.e., lighting and putting out the cigarette) had special significance for them. When the experimenter picked up the matches to light the cigarette, *each subject immediately turned his gaze towards the matches.* After the experimenter lit the cigarette, each subject performed the "post-hypnotic" act—stood up and walked around the room—and *continued looking directly at the cigarette* ... After the subject had carried out the "post-hypnotic" act and after the experimenter had "taken away amnesia for the hypnosis" ... the subjects' reports indicated that they had been more or less aware that the signal for the "post-hypnotic" behavior had special significance for them. Typical comments were: "I made the association between the cigarette and getting up. I didn't figure out why the cigarette should make me get up"; "I knew you were lighting a cigarette and you had told me to stand up, but if you had asked me why I was standing up I would have said my legs were stiff. As I look back I'm certain—if you had asked me why I was standing up—I would have suddenly realized what was happening" (7, p. 12).

tory" suggestions, i.e., when they were told that they were becoming "itchy," "thirsty," and "very hot."

4. The GSR to a pinprick was essentially the same before the experiment and during "hypnotic analgesia." Also, the GSR was essentially the same, during "hypnotic analgesia," (a) when three Ss were told they would receive a pinprick but did *not* receive the pinprick, (b) when they were told they would receive a pinprick and *did* receive the pinprick, and (c) when they received a pinprick without being told they would receive it.

5. Four Ss showed a GSR each time they were asked to look at a "negatively hallucinated" object and person. Two Ss did *not* show a GSR when they were asked to look at the "negatively hallucinated" object (or person). The four Ss who showed a GSR stated, during or after the experiment, that they were by no means convinced that the person or object was no longer in the room. The two Ss who did not show a GSR stated, after the experiment, that they had been "certain" that the object (or person) was not present in the room.

6. Although the Ss stated that they did not "remember" the "post"-hypnotic suggestion (or anything else about the experiment), they usually showed a GSR when the E made the *preliminary* movements to give the signal for the "post"-hypnotic behavior. (They also showed a GSR when E gave the signal for the "post"-hypnotic behavior.)

Since skin conductance is an index of the S's level of "activation," "arousal," or "excitation," these results indicate the following:

1. Ss do not necessarily become more "passive" or "relaxed" during the "hypnotic induction procedure."

2. Ss often become more and more "excited" and "aroused" when they are given a series of "active" suggestions such as "sensory hallucinations," "age-regression," etc.

3. Ss often show momentary "excitement" when they are "hallucinating."

4. A pinprick can "arouse" a S to the same extent during "hypnotic analgesia" as it can during "normal waking." In addition, "hypnotic analgesic" Ss are often just as much "aroused" by the threat of a pinprick as they are by an actual pinprick.

5. Many Ss become momentarily "excited" when they are asked to look directly at an object (or person) which they have been told they will not be able to see. However, *some* Ss do *not* show this momentary "excitement."

6. Although Ss may state that they do not "remember" the "post"-hypnotic suggestion, they often become momentarily "excited" when

the E makes *preliminary* motions to give the signal for the "post"-hypnotic act.

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AN ELECTRONIC AID FOR HYPNOTIC INDUCTION: A PRELIMINARY REPORT

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In the year 1784, Benjamin Franklin, a pioneer in electricity, denounced as a fraud, Mesmer, a pioneer in hypnosis. Today, 175 years later, the work of one is aiding the work of the other as electronic devices induce the hypnotic state. Electronic principles have been applied to the development of the BWS, an instrument specifically designed to induce various levels of hypnosis by subliminal and photic stimulation of the brain waves.

Weitzenhoffer (1) suggests that the alpha waves can be "driven" by intermittent photic and auditory stimulation. A slowing down of alpha activity can be brought about by photic "driving" as produced by a flickering light. He remarks that a properly applied device could induce increased receptivity to suggestions.

Prior to World War II, one of the writers (S.A.S.), cooperated in the development of a lie detector which utilized brain wave frequencies. He also had been engaged in considerable research on other aspects of cerebral physiology. The principle upon which the BWS operates was forcefully demonstrated during the war when the inventor was responsible for the operation of Radar on ships and submarines in the Atlantic Ocean. On several occasions it was noted that Radar operators readily entered into a relaxed state, others fell into deep hypnotic states while watching signals on the Radar screen. The above incidents indicated that these men were being subjected to stimuli at the exact frequency of the electrical energy produced by the brain.

Development of a portable unit was started immediately after the war. Between 1948 and 1957 several laboratory models were constructed to adapt the unit to clinical research. The present model has been field tested for one year and the results, based on accurately controlled data, can now be predicted.

An explanation of the modus operandi of the BWS can be understood if compared to a television receiver. The circuit of a receiver is designed to prevent the picture from drifting up or down. Stabilization of the image is due to a synchronizing signal sent out by the transmitting sta-

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tion. If the vertical hold control on the receiver is set to approximate the pulse frequency of the synchronizing signal, the receiver is triggered in synchronization with the transmitted picture—that is, it must obey the command of the transmitted pulse.

The BWS operates in the same way. The human brain produces pulses or waves of electricity in three general ranges:

Alpha Range—approximately 10 cycles per second
Beta Range—approximately 30 cycles per second
Delta range—approximately 4 cycles per second

The question often arises, "How can one know when the instrument is on the brain wave frequency?" One method is by use of an electroencephalograph to chart the patient's brain waves. Since the instrument (BWS) is calibrated and covers all three ranges, it is a simple matter to set it on the exact frequency of the brain waves. A slowing down of the alpha rhythm is indicative of a sleep-like state. Experimentally, these cortical and subcortical changes could be utilized to signal the onset of hypnosis.

However, this method is time consuming and unnecessary. As in television design, the controlling pulse performs its job if it is set at the same or at a higher frequency than the controlled pulse. This means that one can use an approximate setting at first. With the experience gained from two or three patients, the correct setting can readily be achieved.

The outstanding characteristic of the BWS is that its pulse is shaped to reproduce the brain pulse. It is, in reality, an electronic brain wave—in frequency, amplitude and wave form. The effectiveness of the pulse is increased by transmitting it in color that varies as the pulse rate is varied.

Our data confirms the findings of Walter, Dovey and Shipton (2) who analyzed the electrical response of the human cortex to photic stimulation. They, too, noted that flicker or pulsing could induce emotional alterations which are associated with specific electrical response patterns. Since no apparatus or wires are connected to the patient, this response is achieved as readily with groups as with individuals.

Between August 1957 and August 1958, the Synchronizer has been tested on approximately 2500 patients and subjects, some individually and some in small and large groups. Of these, 200 were female, receiving pre-natal training for childbirth under hypnosis, by Dr. William S. Kroger at the Edgewater Hospital in Chicago. (3) The BWS saved considerable time and energy whenever it was used to induce hypnosis during the group training program. With the proper control setting, we

could predict how many subjects would go into deep hypnosis, into light hypnosis and into a relaxed or hypnoidal state.

The remaining 2300 consisted either of professional groups who volunteered or individuals receiving hypnotherapy. The factors used for evaluating the effectiveness of the Synchronizer are:

1. Number of minutes unit is in operation.
2. Size of group.
3. Previous hypnotic experience of subjects.
4. Expectation level. (This term is defined below)

There is an interesting correlation between the number of minutes the instrument is on and the percentage of successful inductions. The graph (Fig. 1) shows this for three levels—deep hypnosis, light hypnosis and a relaxed or hypnoidal state. For the first five minutes there is a gradual increase in the number of subjects who enter deep hypnosis. At this level, a figure of 50% reach the deep state. Two important observations are noted here:

1. The inductions achieved by the Synchronizer reach a combined total of almost 80% for deep and light levels in the first five minutes. Improved techniques indicate this will be shortened to three minutes.

2. The percentage of deep inductions is twice the number of those remaining in light hypnosis.

When we first began our experiments we used verbalizations to facilitate induction. Later, it was only necessary to inform the patient what

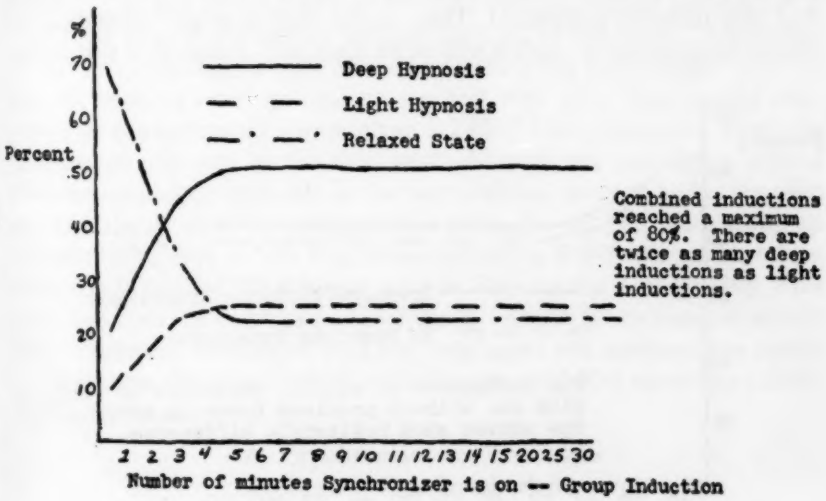

FIG. 1

to expect. The instructions were as follows: "Concentrate on the center of the instrument. When your eyes become tired and heavy, as they will, just let them close and feel yourself going deeper and deeper into a relaxed state."

The photic stimulation produced by the instrument induced hypnosis if and when an expectant attitude or "mental set" was created. The authors are well aware that the alteration in perception resulted from the structured situation. Results of the instrument's effect by itself could be assayed only if the BWS was used on naive and unsophisticated individuals or groups who would serve as adequate controls. This was done on about 5% of those participating in the present experiment. A larger sample is now being tested.

A typical quote from a primipara who was originally induced by the BWS and delivered by hypnosis without analgesia or anaesthesia for the labor and episiotomy repair is as follows: "At the first class I watched, but I was so scared it wouldn't work that I didn't even try. But after the machine was turned on I concentrated on the light and relaxed completely. I thought somebody was going to swing something in front of my eyes until I went to sleep. It wasn't sleeping at all, just relaxing and strong concentration."

The obvious advantage of the BWS is the considerable saving of time and effort for both patient and therapist. A frequent complaint, especially by patients in labor, is the unavailability of the obstetrician during the onset of labor. Patients placed *en rapport* with the Synchronizer find this problem minimized. They realize that it is an "extension" of the doctor's presence; that it will relax them and if desirable will main-

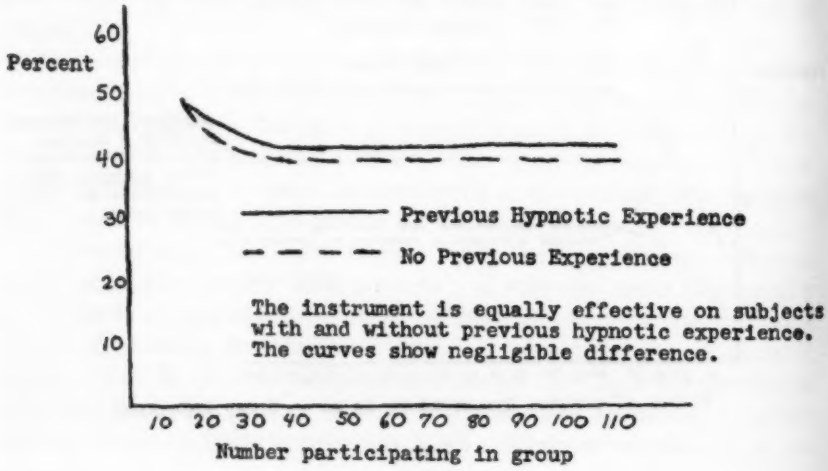

FIG. 2

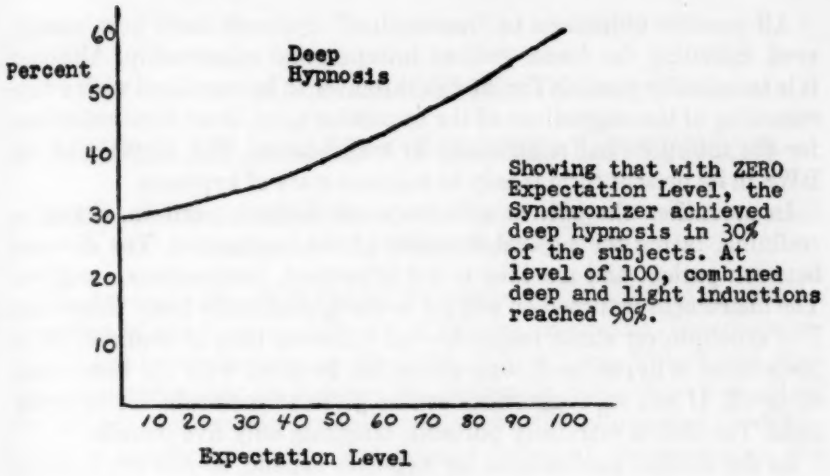
Percent
60
50
40
30
20
10
Deep
Hypnosis
Showing that with ZERO Expectation Level, the Synchronizer achieved deep hypnosis in 30% of the subjects. At level of 100, combined deep and light inductions reached 90%.
10 20 30 40 50 60 70 80 90 100
Expectation Level

FIG. 3

tain the hypnotic state for long intervals. For this reason the BWS has tremendous potentialities for use in labor rooms and dental offices.

The size of the groups varied from 15 to 110. To further test the potential of the unit, separate figures were kept for groups with and without previous hypnotic experience. As shown in Fig. 2, there is negligible difference in the two curves. In both cases, attendance beyond 40 did not affect the result. It should be emphasized the charts represent group results. A higher percentage was reached with individual inductions.

For the final group figures we charted a set of conditions designated as the "Expectation Level". Subjects entering the experiment "cold"—that is, with no previous explanation and who were immediately subjected to the instrument, were given a ZERO level. However, when the instrument was used as the final part of a program containing several demonstrations of hypnosis in the conventional manner and a detailed explanation of what the instrument will do, the subjects were given an Expectation Level of 100. Fig. 3 shows that the BWS will produce deep hypnosis in 60% of the subjects with an Expectation Level of 100. This indicates that the combined inductions at various levels reached almost 90%. Improved techniques with the instrument will increase this figure.

Deep hypnosis in individual inductions reached 80% under the following conditions:

A. Synchronizer on 5 minutes
B. Expectation Level of 50

This is in addition to the conventional considerations of the subject's physical comfort, motivation, confidence and other variables.

All possible objections to "mechanized" hypnosis have been considered, including the doctor-patient interpersonal relationship. Although it is technically possible for the Synchronizer to be combined with a tape recording of the suggestions of the hypnotherapist, there is *no* substitute for the interpersonal relationship or transference. The function of the BWS in its present form is only to induce a state of hypnosis.

In operation, the patient assumes a comfortable position, sitting or reclining, facing the general direction of the instrument. The distance between patient and machine is not important. Instructions are given. The instrument is turned on and set to the approximate brain frequency. The synchronizer starts instantly—no warm-up time is required. After the subject is hypnotized, suggestions can be given with the instrument on or off. If left on, suggestions can be given to maintain the hypnotic state. The unit is extremely portable, weighing only five pounds.

As the clinical applications for hypnosis expand, so will the demand for electronic aids. The present application of the BWS is the beginning of a long range program which may have far reaching significance in subliminal projection and other fields of communication. As the functions of the reticular activating system and the alpha waves in their relationships to alterations in perception and consciousness are elucidated, more light will be shed on the worth and development of hypnosis-inducing devices.

The BWS has already proved its worth in medicine, dentistry and obstetrics. Further research is necessary to prove the effectiveness of this device in all fields to produce "dissociative" states of greater receptivity to suggestions. The authors believe that the instrument will have a salutary effect in the field of clinical and experimental hypnosis.

References

1. Weitzenhoffer, A. M.: *General Techniques of Hypnotism*. New York: Grune & Stratton, Inc., 1957
2. Walter, W. G., Dovey, V. J., Shipton, H.: Analysis of electrical response of human cortex to photic stimulation. *Nature. 158:* 340–541, 1946
3. Kroger, W. S.: Hypnotherapy in psychosomatic obstetrics and gynecology. *J. Arkansas State Medical Society*. Dec. 1957

ANNOUNCEMENTS

AMERICAN BOARD OF DENTAL HYPNOSIS

A Section of the American Board of Clinical Hypnosis, Incorporated
Statement of Policy, January, 1959

The American Board of Dental Hypnosis was established in 1958, as a section of the American Board of Clinical Hypnosis, Incorporated. The Board is incorporated in the State of New York. This Board shall be developed so far as possible in conformity with other recognized Boards of the American Dental Association, with allowances for differences in training measures and related technical considerations. We shall call upon the Council on Dental Education of the American Dental Association for advice and guidance as is necessary.

The purposes of the Board is to certify trained or experienced dentists in dental hypnosis, with consideration for their basic training in the several dental specialties and areas of practice in which dental hypnosis shall be employed. Dental hypnosis shall be utilized within the specific area of professional competence within the realm of dental practice. Certification shall be based on examinations as deemed appropriate and necessary by the Board, in addition to training and experience.

Organization and Function

1. The structure of the Board, its method of operation and its examination or other requirements shall be subject to modification during its growth. It will determine the levels of education and experience of candidates for certification as close to the requirements fixed by the Council on Dental Education, as is feasible, bearing in mind to maintain the highest ideals and standards of the dental profession, and in conformity with the principles and directions of the Society for Clinical and Experimental Hypnosis and The Institute for Research in Hypnosis.

2. Provide and administer comprehensive tests of qualifications of candidates for certification as Diplomates in hypnosis.

3. To fix the limitation of general and special practice which holders of certificates as specialists will be required to observe.

4. To issue certificates of competence to dentists who satisfy the requirements of the Board. They shall have the status as Diplomates.

Proper mention of such status shall be confined to situations deemed acceptable and ethical, in accordance with traditions established by other American Dental Association Specialty Boards.

Diplomates of the Board shall be expected to abide by this Policy Statement and its modifications, and by any other regulations set by the Board.

Qualifications of Candidates and Certification Fee

1. Satisfactory moral and standing in the dental profession.
2. Member of the American Dental Association, the National Dental Association or the Canadian National Dental Association.
3. A period of study acceptable to the Board, and a minimum of five years of documented experience in clinical dental hypnosis. Such experience shall be acceptable without examination only until December 31, 1959.

This Policy Statement may be amended by the Board, with additions and alterations. Such amendments shall be numerically appended hereto and Diplomates shall be expected to abide by them.

Amendments

1. Diplomates are expected to practice dental hypnosis as part of their over-all practice of dentistry, in accordance with their practices related to basic specialities certified by other American Dental Specialty Boards.
2. Diplomates are required to refrain from demonstrating hypnotic techniques to non-professional audiences.
3. The Board shall have a President and a Secretary-Treasurer. Duties of the latter may be divided, if necessary, between two officers, a Secretary and a Treasurer. The aforementioned officers may be assisted by a Vice-President and additional officers, if deemed necessary. A varying number of Board members-at-large may be appointed by the officers and they shall be known as Directors of the Board.
4. Officers of the Board shall hold such office only if they are already Full Members or Fellows of The Society for Clinical and Experimental Hypnosis.
5. Directors of the Board may be appointed only if they are Full Members or Fellows of The Society for Clinical and Experimental Hypnosis, unless they are selected by special arrangement with the American Dental Association without having had prior experience in the practice of dental hypnosis.

For information write:
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ERRATUM

In the review of Dr. S. Irwin Shaw's book, "Clinical Applications of Hypnosis in Dentistry" by Dr. Arthur Wald, statements quoted by the reviewer as having been made by Dr. Andre M. Weitzenhoffer in the Forward, were erroneous and were not made by him.

In the April, 1958 issue of the Journal, the review of Dr. Weitzenhoffer's book, "General Techniques of Hypnotism" by Dr. Henry Guze contained the following quotation from page 4 of that book: "Mismanagement is least likely to occur with qualified clinically oriented hypnotist; is found too often with professional research workers who look upon their subjects as guinea pigs, not as human beings; and is a constant occurrence with amateur and stage hypnotists". The italics which were utilized in part of that quotation were put in by the reviewer and were not part of the original statement by Dr. Weitzenhoffer.